SOME OBSERVATIONS ON TONSILS

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I have chosen this subject for many reasons: (1): Enlarged and diseased tonsils are common in this district: The causes are, probably, the flat and low-lying country, the underlying surface and artesian water, the constancy and variability of the winds, and the proximity to the sea. Our climate is not unlike that of the British Isles on the whole, though we are ten degrees nearer to the equator. We have a heavy vapour density and fogs are common. Hot winds from the N.W. will be followed by cold S.W. winds and rain, or the biting East winds with or without a drizzle. (2) Because so many operations are done upon the tonsils in this country, and particularly in this town.

For my paper I have had to rely on the "British Journal of Laryngology," the "American Laryngoscope," the "British Medical Journal," about half a dozen standard works on Ear, Nose and Throat, and some excerpts from Continental works sent to me by the Librarian of the Royal Medical Society. Brieger's and other Continental works I have been unable to procure.

My work as throat surgeon at the Christchurch Hospital has afforded me a fairly large experience, but I regret that I have been unable to get any pathological research work done on the tonsils I have removed. However, I would like to draw certain conclusions from my experience, and from my reading, which, may offer something interesting and profitable to the profession.

I shall begin with a short description of the anatomy of the tonsil, and shall quote largely from "Cunningham's" anatomy.

The tonsils are lymphatic glands. They are composed of masses of small rounded lymph cells connected with tissue reticulum. The inner surface is covered with epithelium continuous with that of the pharynx and mouth. This epithelium dips into the substance of the tonsil, forming deep tubes or crypts reaching almost to the outer surface of the organ. The outer surface is invested with a connective tissue capsule. Cunningham is not definite in saying whether this capsule is, or is not a part of the pharyngeal fascia (pharyngo-basilar fascia), outside of which is the superior constrictor muscle. Some authorities say that the pharyngeal fascia projects like a "u" internally into the two pillars of the fauces. Others hold that this is the capsule of the tonsil. One authority says that this capsule is double, and with care one can during enucleation get between the two parts of it and separate them. On one occasion I felt almost certain that this was so, and enucleation in that case was particularly easy, the after result being excellent, no tonsillar tissue remaining, and no marked after-contraction being visible. There is still a difference of

opinion as to whether the supra tonsillar fossa is in the tonsil or above it. Some operators state, and Sir St. Clair Thomson shows in his book, "tonsils removed with the supra tonsillar fossa" that the supra tonsillar fossa is really an intra-tonsillar fossa; but it has been shown that lymphatic tissue is found in the pillars, and the palate, particularly the lower portion of the palate and uvula, and one wonders if in removal of the tonsil, these operators have not been taking away part of the palate as well as the tonsil. I fear also that in these cases when the wound is healed, the resultant contraction must produce deformity and consequent interference with the freedom of movement of the palate and the actions of the palato glossus, and the palato-pharyngeus muscles. It will be noted that Hudson Makuen fears that damage to the latter muscle interferes with the action of the vocal cords, because the muscle has a direct action upon the thyroid cartilage.

The question of muscle in the tonsil is another very important point. Some say that there are distinct muscle fibres running from the capsule into the tonsil. I regret I am unable to discuss this with any authority because, as I have said, I have had no opportunity of sectioning the tonsils and examining them under the microscope. I have seen muscle attached to the tonsil after what I thought was a good removal, and one other New Zealand Surgeon who saw me do that removal told me he obtained the same results. Macroscopic sections of that tonsil showed, apparently, muscle going a quarter of an inch into the substance of the organ. Some have said that the muscle extends far into the substance of the tonsil, and by its contraction keeps the tonsil in place. I fail to see the reason for this when one considers that the tonsil is held in place by fibrous trabeculæ stretching through its substance and attached to the capsule. My belief is that in our beautiful extra capsular enucleation, we remove portions of the superior constrictor muscle. In the one case where I thought I had got between the two layers of the capsule, the result was good, and I did not see any signs of muscle fibres.

The relationship to the large vessels of the neck is such that one does not need to consider these vessels. It is said that in rare cases the internal carotid or the facial may come into close relationship with the tonsil. These cases must be very rare indeed, and where they do occur, if the operator does not injure the pharyngeal fascia there should be no danger of damaging the vessels.

The blood supply of the tonsil is very important. It is said to come from the ascending palatine, the tonsillar branches of the external maxillary (facial), the ascending pharyngeal and the dorsalis linguæ. There is also a descending tonsillar artery from the internal maxillary. Most of these arteries break up into a network outside the capsule, but one large vessel, made up chiefly of the descending tonsillar artery of the internal maxillary and a branch from one of the others, descends from the upper pole of the tonsil and pierces the

capsule about the junction of its upper and middle thirds. Most operators state that sharp bleeding comes from this vessel, and that is my experience. Veins collect in a plexus on the outer side of the tonsil, which is really part of the pharyngeal venous plexus. The large oozing, that is seen after enucleation, comes from these vessels, and can easily be stopped by pressure. Pressure, in fact, will stop the arterial bleeding in most of the cases. Rarely, one has to apply pressure forceps to the bleeding artery, and only occasionally ligature it. My experience is that persistent pressure and a dose of morphia will stop all bleeding in these cases. One may have to sit down by the patient for an hour. Suturing of the pillars seems to me to be unsound in practice, causing damage to the muscles, preventing free drainage and resulting often in deformity. Out of several hundred enucleations, I have had to sit down by patients on three occasions for an hour at a time, and the House Surgeon has done the same in one or two other cases.

The nerves of the tonsil are derived from the vagus, glosso-pharyngeal and sympathetic. The surrounding palate is supplied by the palatine branches of the spheno-palatine ganglion. After injecting a local anæsthetic around the tonsil, the tonsillar plexus can be anæsthetised, but it is difficult to affect the pharyngeal plexus beyond the pharyngeal fascia; therefore, my experience is that all pain in the manipulation required in enucleation cannot be obviated by the use of the local anæsthetic alone. The pharyngeal plexus is rendered less sensitive by a hypodermic injection of morphia and atropine, which, of course, affects all the nerves of the body.

The lymphatics of the tonsil are also important, and there is a great variety of opinion about them. They form a plexus around each follicle, and pass to the outer surface of the tonsil through the pharyngeal wall to the deep cervical glands. A few observers state that the lymphatics of the nose, particularly the floor, of the upper surface of the palate, and of the gums, run backwards and downwards into the tonsil, making out that the tonsil is a true lymphatic filter. Some hold that the tonsil is an excretory organ and that there is a lymph flow on to the surface epithelium. Others hold that the epithelium is an absorbing surface, with a selective action. This will be discussed later.

Davis, in the "Laryngoscope" of March, 1917, states that there is one artery descending through the upper pole, which causes all the bleeding.

Hudson Makuen, of Philadelphia, says that the palato-pharyngii muscles have attachments to the superior cornua of the thyroid cartilage, and thus they have been called thyroid tilting and cord-stretching muscles.

Dr. R. D. Patterson says that the so-called capsule of the organ is merely a portion of the intra-pharyngeal fascia. Makuen is convinced that the capsule does not exist as an obvious entity like the capsule of the kidney. It is merely that portion of the intra-pharyngeal aponeurosis into a recess of which the tonsil develops.

The so-called capsule only embraces a portion of its outer surface. The aponeurosis consists not of a single, but of multiple or several layers of fibrous tissue, which may be easily separated, the one from the other, in somewhat the same manner that the layers of an onion can be separated. The thin inner layer, however, has become so much a part of the tonsil that it is quite impossible to separate the two. Intra-capsular tonsillectomy, therefore, is one in which only a thin layer of the fascia capsule is found adherent to the tonsil after the operation. The capsule of the tonsil varies with the age of the tonsil, becoming thicker with age. In young children the tonsil is not firmly adherent to the capsule except by thin subareolar connective tissue. The closer union takes place with age. Muscle fibres are found binding the so-called capsule to the substance of the tonsil, and these appear to come not from the constrictor muscles, but rather from the fascia itself. A complete extra capsular tonsillectomy must leave a window in the intra-pharyngeal aponeurosis, exposing the constrictor muscles and opening up avenues of infection. Facial cotractions during enucleations are due to irritation of branches from the spheno-palatine ganglion, from the seventh nerve, which supply the palate.

Dr D. R. Patterson, in the "Journal of Laryngology," September, 1913, states that the supra tonsillar fossa is in the tonsil, and his drawings would appear to prove that, but I cannot see anything in his article to show that the anterior wall of the supra tonsillar fossa, as far as its lymphatic tissue is concerned, is distinctly separated from the lymphatic tissue of the palate by a fibrous ring, that is the so-called capsule.

Sir St. Clair Thomson's photographs of enucleated tonsils would appear to show that the supra tonsillar fossa is wholly inside the tonsil, but again I would like to have seen sections proving that there was no continuity between the narrow layer of the lymphatic tissue in the apparent upper or anterior part of the fossa and the palate.

Wyatt Wingrave in the "Journal of Laryngology" of April, 1914, speaks of the skeletal muscle attached to the enucleated tonsils removed by other means than the guillotine. He says that these muscle fibres are directly continuous with the pharyngeal constrictors, and can be traced for a short distance into the substance of the tonsil. I cannot help feeling, even yet, that if only the very thin innermost layer of the capsule is removed with the tonsil, as Makuen indicates, that no muscle should be, macroscopically at least, seen in the tonsil. Wingrave definitely states, in his conclusions, that the muscle does enter the substance of the tonsil. He, however, states that they are usually avoided in partial removal by the guillotine, but disturbed during enucleation, and he says that these muscle-bundles, when cut, afford a channel for infection of the deep cellular spaces. This would appear to condemn enucleation, but my feeling is that Makuen's so-called intra-capsular enucleation is the real operation that should be performed, as it removes the innermost layer of the fibrous covering and excludes all muscle.

Henke, in 1914, injected soot into the various parts of the nasal mucosa, and showed in man that there was a direct lymphatic connection between the nose and the tonsils. By similar methods he proved a connection between the gums and the tonsils.

Sir St. Clair Thomson says that tonsils are composed of lymphatic cells collected into groups called follicles and separated from one another by layers of connective tissue. The surface of the tonsil is generally irregular, being indented with crypts, into which open the ducts of mucous glands. The epithelium covering the tonsil is squamous. There exists a direct lymphatic connection between the nose and gums and the tonsils. The plica triangularis, according to Kimpton, covers the tonsil anteriorly. It divides a little above its middle into two distinct portions. The upper part of the plica triangularis is continued above the tonsil until it meets the posterior pillar. The lower part passes downwards and is attached to the tongue, forming a triangle, and sometimes covering in a large portion of the lower part of the tonsil. It is between this structure and the tonsil and between the tonsil and the anterior pillar that secretion and debris collect. The crypts are ingrowths of the surface epithelium and usually terminate close to the capsule. They are larger and more numerous in the upper part of the tonsil. The tonsil is surrounded externally by the pharyngeal aponeurosis which is rather loosely associated with the capsule. From this one gathers that Thomson looks upon the capsule as a distinct entity. He says that the facial artery sometimes comes into close relationship with the inferior portion of the tonsil. This, as I have said should be no danger to the expert surgeon who has the pharyngeal fascia between him and the artery.

Tilley, in speaking of the supra-tonsillar fossa says:—"It is situated above the upper part of the tonsil, between the anterior and posterior pillars. It may extend into the soft palate up towards the uvula. The upper lacunae or crypts of the tonsil open into this space.

Barnes in his book on the tonsils says that the outer surface of the tonsil is covered by a fibrous membrane, the capsule, from the inner surface of which trabeculae extend inwards dividing the tonsil into lobes. He says the crypts are from 10 to 20 in number; their calibre often being greater at a depth than at the surface. The plica triangularis is a reduplicated fold of mucosa with the fibrous layers in apposition—it therefore consists of four laters. The plica triangularis has its apex attached to the uppermost part of the posterior pillar, its perpendicular attached to the inner border of the anterior pillar, and its base inserted into the pharyngeal wall at its junction with the tongue. It encircles the lower pole of the tonsil like a sling. With the forward growth of the tongue, the inferior insertion of the plica often becomes smaller, and the plica is represented by a mere fringe.

In my experience in adults, the plica triangularis is very constant, is often thick, and forms a regular watch pocket involving half the vertical depth of the sinus tonsillaris. I have found secretion and debris collected between the plica and the tonsil. By

pulling forward and downwards the plica I have exposed crypts or lacunae packed full of caseous débris. It is because of this that I agree with some writers that the plica triangularis should always be removed, and its removal alone may be sufficient to cure the condition complained of. These are the cases of buried tonsils, that most writers say are a dangerous variety. In passing, too, I may state that, when enucleating, I always draw the tonsil and the plica to the middle line and cut between plica and the anterior pillar.

Barnes says that the supra-tonsillar fossa lies between the superior pole of the tonsil and the superior angle of the sinus. He admits that there is a thin layer of lymphoid tissue found in the superior wall of the sinus. I am glad to find this because Sir St. Clair Thomson and others seem to hold that this fossa is in the tonsil. This lymphoid tissue in the superior wall will probably be found continuous with lymphoid tissue in the arched edge of the palate and the uvula. Barnes also supports Makuen in stating that the so-called capsule of the tonsil is not part of the tonsil, but as age advances it becomes attached to it. He states that the tonsil does not lie under the mucous membrane, but develops in the substance of the mucous membrance, that is, it lies between the flat epithelial covering and the fibrous tunica propria of the mucous membrane, in fact it is like the other lymphoid nodules in other mucous membranes of the body. When one considers this, one feels that Makuen's so-called intra-capsular enucleation is the true operation, and that if this were done with care, no muscle fibre probably would be found in the organ removed. Barnes is not very definite about the blood supply. He says that the chief blood supply is from the tonsillar and ascending palatine branches of the facial, which pierce the superior constrictor and enter the lower half of the tonsil. I still think that the artery formed by the union of the descending palatine branch of the internal maxillary, and one of those former vessels, which enters in the upper part of the tonsil, is the chief source of bleeding, and that the other vessels break up into very fine blood vessels before actually entering the tonsil. Regarding the lymphatics of the tonsil, he says that no afferent lymphatic vessels have been shown to enter the tonsil, though he quotes Henke, who states that he has found coloured particles in the tonsil after injection into the mucous membrane of the nose and gums. Barnes says that Wright and others claim that the tonsils regularly enlarge during the period of dentition. Clinical experience in children would lead him to agree with this decision especially with regard to the teeth. The efferent lymphatics, he says, as others do, discharge into the deep cervical glands. There is one warning that he utters which is worthy of note, namely, that the most posterior of the submaxillary glands is commonly confounded with the tonsillar glands. This, he says, is enlarged from lesions of the gums, tongue or cheeks, one of the commonest causes being a dental root abscess. He states that there is a possibility of tubercular affection reaching the apices of the lungs through the cervical chain of glands from the tonsil. I doubt if this is sincerely held by many. He mentions the

close connection between the lower pole of the tonsil and the lingual tonsil where the plica triangularis is narrow, and warns operators against punching lymph masses in that area which may be parts of the lingual tonsil, as protracted venous bleeding may result. We all know that there is a large venous plexus lying in the lingual tonsil. The capsule, he says, is composed of the deeper layers of the tunica propria of the mucosa of the sinus tonsillaris, separated from its epithelium by the development in its superficial layers of the lymph node called the tonsil. He says that this capsule is composed of fibrous tissue with numerous elastic and striated muscle fibres interspersed, the muscle fibres being derived from the superior constrictor and the palatal muscles. Personally, I doubt if the existence of this muscle has ever been proved.

THE FUNCTION OF THE TONSILS

There is a diversity of opinions regarding this. The organ of course, is a lymphatic gland or node. If a gland, it should have afferent and efferent lymphatic vessels. If a node, like the Peyer's patches of the intestine, it does not necessarily have afferent vessels. From its position in the mucous membrane of the fauces it is like a node, yet it seems that Wright and others have proved that there are afferent vessels to it from the nose and gums. If so, its function, like that of other lymphatic glands is that of a sieve or septic tank in the course of the lymphatics. Its frequent infection renders it liable to repeated enlargements, and, lying comparatively free in the fauces, its enlargement is easy, its blood supply good, and therefore it is capable of doing its work rapidly and efficiently. Dental and nasal affections are unfortunately so common in children that tonsillar enlargements are necessarily also common. This means that the tonsillar gland may remain enlarged to cope with the excessive amount of work it has to do. I am, therefore, of opinion, that if the gland is merely enlarged that is, if the lymphoid tissue is in excess, the gland is performing a necessary work which should not lightly be thrown upon the next septic system, the deep cervical glands. This means that pure hyperplasia is not a reason for removal. When the glands, however, become diseased and are not able to perform their function, removal may then be considered. In cases of pure hyperplasia removal, in my opinion, should only be performed when the tonsils are causing obstruction to respiration or pressing the palate back and preventing free access of air into the middle ear through the eustachian tubes. I believe that far too many tonsillotomies are performed upon children to-day. If the tonsil of Lushka projects like polypi from mucous membrane of the naso-pharynx, its removal alone is often quite sufficient. Attention to the nose and the teeth of the child are to me more important than the removal of the tonsils, as the tonsil begins to atrophy at puberty. In this case nature will perform the operation that we have been doing wrongly. In cases of hypertrophy attended with undesirable symptoms, simple tonsillotomy is the correct operation. This will relieve the

breathing and free the eustachian tubes without interfering with the pillars of the fauces which are rapidly developing at this time. This brings me to another possible function of the tonsil. The tonsil keeps the pillars apart, and as these pillars contain muscles which act upon the palate and the thyroid cartilage, they must have something to do with the development of the fauces as part of the vocal organ. Once again, I believe that they have a function to perform in the act of deglutition by keeping the pillars apart. They offer a broad surface in the fauces to take up, and grip the bolus of food as it is passed backwards by the tongue from the mouth to the pharynx. The gripping action takes place by the contraction of the superior constrictor in conjunction with the alternate contraction of the muscles of the pillars. If, as the result of enucleation in children, this broad surface is narrowed to a little more than a line, the gripping effect is lost to some extent, as through the possible union of the two pillars, the alternate action of the palato-glossi and palato-pharyngei muscles is lost. The union of the two pillars by adhesions following enucleation interferes with the proper balance of the palate, and as the child grows this balance can never properly be established. There is still another function supposed to be possessed by the tonsils, and that is they are lubricators of the fauces. Deep down in the tonsils, in or next to the capsule, are to be found mucous glands which discharge into the crypts. The mucous from these glands, along with that from glands in the pillars and palate form a lubricated passage for the food in deglutition. It is also said that the tonsils can take up bacteria from their surface and from the crypts and deal with them as they pass from the mouth to the pharynx. I think this is an absurd supposition, as the number of organisms likely to adhere to the tonsil is so small in comparison with the number of organisms swallowed in the bolus as to be absolutely negligible. I believe that the crypts which are possibly for the storage of mucous, and are emptied during the contraction of muscles in swallowing, may become charged with organisms, and if these penetrate the epithelium, the lymph tissue of the gland is able to deal with them as it does with organisms carried to it by its afferent vessels. The crypts may also become loaded with organisms and white cells which have emigrated through the epithelium. It is only when the tonsils are overtaxed and diseased and these crypts cannot be emptied, that they become a danger to the body.

Barnes discusses the functions of the tonsil at moderate length. As to the production of lymphocytes, it serves the same purpose as the other lymph nodes of the body, and therefore, if that is its only function, the tonsil can be removed with impunity. As far as the internal secretion theory is concerned, nothing has been proved, but we are also unable to say that it has no internal secretion.

The protection theory I am inclined to favour as being one of the functions of the tonsil. I believe that part of this action is on organisms coming from the nose and mouth and partly

organisms penetrating the epithelium of the tonsil, and perhaps partly the emigration of the leucocytes into the crypts, where they destroy bacteria. Regarding this last, in **healthy tonsils** it should not be necessary, as the muscular action around the tonsil, and perhaps in the tonsil itself (if Barnes is right in stating that striated muscle is found in the substance of the tonsil), should keep the crypts clear. The elimination theory does not appeal to me at all. If it is true that the tonsils become infected during the course of diseases, I think that that is part of a general lymph node infection through the blood. Others, of course, hold that, in some general infections, the tonsil is the portal of entry. That will be discussed later.

The Immunity Theory does not appeal to me at all. The healthy crypts should not contain active bacteria at all. Lance, in the "Gazette des Hopiteaux," March, 1910, claims that simple hypertrophy is not pathological. It means resistance to infection. These tonsils are pale and smooth, and are not inflamed. They are seen throughout dentition. When they are inflamed there is a change in colour, and there is a reactionary redness seen in the pillars.

Goerke, in May, 1914, affirms the defensive role of the tonsils. Involution begins at 12, and enucleation should not be performed at a younger age than this. With this view I agree, and I too, with Goerke, disagree with Bosworth, who says that the existence of the tonsil is a sign of disease.

Kenyon, in "The Annals of Otology," December, 1916, states that the tonsil serves as an absolutely necessary factor in providing a channel for the action of the palato-glossus muscle. Tonsillectomy serves to destroy, not merely a possible lymphatic function, but also to disturb an important physico-mechanical function. More or less impairment of the action of the depressor palati muscles must occur in practically all cases following tonsillectomy. I believe that this is true in the case of young children, and I believe that unless the tonsils are badly diseased or tuberculous, enucleation should not be performed until after puberty, and then only after due consideration, when Makuen's operation should be done. Here I may state that I can never see how enucleation by the guillotine can possibly give Makuen's result. Careful dissection alone can permit one to follow the real line of cleavage between the true capsule, or the tunica propria, and the pharyngeal fascia.

Dr. McBride, in the "Journal of Laryngology," of August, 1916, to my mind, utters a well-needed warning against the promiscuous removal of the tonsils by enucleation. He is quite right in saying that one might as well enucleate the pharyngeal and the lingual tonsils.

Hudson Makuen, of Philadelphia, says there are three ways in which lymphoid tissue of the upper respiratory tract may affect the voice, and notes its development, first through its action as a lubricant to the pharynx; second, through its influence upon the action of the muscles employed in phonation; and, third, through

its effect upon the resonance chambers of the voice. Normal lymphoid tissue lubricates the pharynx, while abnormal lympoid tissue either fails to lubricate it, or lubricates it too much. The muscles chiefly influenced are palato-pharyngei, palato-glossi, and the superior constrictor muscles. In the case of children, the active lymphoid tissue has important systemic functions, and the voice is more easily injured during the growth and development of the vocal organs than after they have come to maturity. A mere occasional attack of tonsillitis is not a sufficient reason for removing the tonsil. Other things being equal, the less radical the operation, the less likely the injury to the voice.

Normal lymphoid tissue in the upper respiratory tract should never be removed.

Swain, in the "New York Journal," of December 5th, 1914, says that it can be safely assumed that the tonsil is absolutely in every case a lymph node, and as such should be protected from rude destruction. When dentition starts, the faucial tonsil shows activity, and later the lingual tonsil. A simple hyperplasia cannot be detrimental to health unless it becomes extensive enough to obstruct respiration. I would also add, "if it obstructs the eustachian tubes." There is reason to believe that tonsils are often sacrificed which would, in due course, remove themselves. In adults, whose tonsils have failed to undergo atrophy, operative treatment may be considered.

Swain says that he cannot subscribe to the view that enlargement of the tonsil is in itself a menace. He says also that it will be conceded, even by the most radical operators, that the fibrous capsule of the tonsil is a very valuable anatomical structure, and that its retention is highly desirable. Here he is confounding the true capsule with the pharyngeal fascia.

Henke, in his "New Experimental Observations on the Functions of the Tonsils," states that the tonsils are lymphatic glands, which act as filters for the lymph which passes through them. Like other lymphatic glands, they serve for the production of corpuscles. Having a large, free surface, increased by the crypts, they are able to get rid of a considerable amount of foreign substance caught in their tissues by an exudation into the crypts and on to the free surface of the tonsil.

Brieger does not believe that the cells carried out with this lymph flow are phagocytic in action, but are accidentally carried out. Therefore, he does not believe in the defensive action of the tonsils against infection by the passage of substances into the tonsil.

Henke says it follows that tonsillitis occurring either alone or in association with some other disease, such as rheumatism, is seldom due to infective material gaining entry through the surface of the tonsil, but the result of a secondary infection conveyed by the lymph stream, the portal of entry being, in most cases, somewhere in the nose, the accessory sinuses, or the mucous membrane of the mouth.

Regarding the possible function of immunity, Dr. Conroe, of York, Pennsylvania, believes in continual auto vaccination, and protests against indiscriminate removal of the normal tonsil.

Freedman, in the "Annals of Otology," volume 22, states that the tonsil has a function only in the early years of life, and that it is not an organ absolutely necessary to the body.

Gordon Wilson, of Chicago, holds that plasma cells are derived from the lymph cells, and they actively engage in combating toxines passing through their substance.

Schreiber, in 1913, says that very little is known about the physiology of the tonsils; they probably serve the purpose of a filter against bacterial invasion, and their purpose is protective, especially in youth; but when this filter becomes chronically inflamed it is a source of danger.

Nelson, in "Progressive Medicine," of March, 1916, thinks that the tonsil is like other glands of the body, and therefore its removal means only one defence less.

Frinzi, in the "Italian Journal of Otology," No. 6, 1914, recounts experiences of extracts of tonsils being injected into animals, and comes to the conclusion that there is no internal secretion peculiar to the tonsils.

Tilley says observations have shown that there is a free phagocytic migration from the interior to the surface of the tonsils, and possibly these wandering cells exercise a protective function in destroying many of the septic organisms so constantly present in the mouth.

I cannot honestly agree with this, and prefer to accept the theory that the lymph cells are extruded along with the lymph into the crypts and on to the surface of the mucous membrane, and that they have performed their function inside the gland—that is, when they have been excreted.

Auerbach says that the tonsils are part of the lymphatic system which drains the mucous membranes of the nose.

Layton, in "A Plea for Fewer Tonsil Operations," 1915, believes that the faucial tonsils form an early and very important line of resistance to organisms which invade the body through the mouth and nose. When these organs are found enlarged, it must not be inferred at once that they are the cause of any surrounding inflammation. He thinks that too many operations are being done.

PATHOLOGY OF THE TONSIL

Pathology of the tonsil in relation to operations of the tonsil.

Affections of the tonsil can be divided into inflammations (i.e., those caused by bacterial invasion), traumata, cysts, and new growths. For the purpose of this thesis, I intend only to deal with the first variety, namely, inflammatory condition of the tonsil. I might also add one condition, namely, the retention of secretion.

1. Between the plica triangularis and the tonsil.

2. Between the tonsil and the pillars.
3. In the supra-tonsillar fossa.

But as these are usually associated with inflammations, they can be included in the first group.

The acute inflammations I will rapidly pass over, as operative interference is seldom done in these conditions.

Acute inflammations:

a. Inflammation of the epithelial covering of the tonsil, which is part of an ordinary acute pharyngitis.

b. Acute lacunar tonsillitis, where the inflammation especially affects the lining of the crypts or lacunæ. In these cases a yellowish or whitish deposit can be seen at the mouths of the crypts, and this consists of desquamated epithelium, extravasated lymph cells of different kinds, mucous from the glands, which pour the secretion into the crypts (this mucous is usually altered in character in becoming more viscid etc) and bacteria.

c. Acute follicular tonsillitis (often confounded with acute lacunar tonsillitis), which is evidenced by infiltration in the lymph follicles of the tonsil, particularly those lying adjacent to the lacunæ. Organisms, by microscopic section, can be found lying in or among the cells of the follicle. Minute abscesses often form, and frequently rupture into the lacunæ and are discharged on the surface of the tonsil. At other times they disappear by absorption and phagocytic action. In few cases a more or less large intra-tonsillar abscess may form by the union of two or more of these.

I was recently called out to see a child who had been running a temperature of from 101° to 103° for two or three weeks with moderate enlargement of the cervical glands. The tonsil was slightly enlarged on the right side, but showed no superficial reaction. The upper part of the anterior pillar was reddish-purple, and I judged that there was a deep-seated intra-tonsillar abscess. Retracting the anterior pillar at that area I pushed a pair of strong sinus forceps into the deeper part of the upper half of the tonsil and evacuated pus from a cavity about the size of a pea, surrounded by bluish-black necrotic tonsillar tissue.

This child was fifteeen years of age. The pus contained a large number of streptococci. The temperature fell to 99 the same night, but the next day the temperature rose to 103 and the pulse to 140. The girl was put on small doses of calomel and frequent doses of stock anti-streptococcic serum, 10 cc's at a time. In forty-eight hours the condition

subsided. In a few days the other tonsil became affected, and the glands on that side likewise. No operation was done on that tonsil, but an autogenous vaccine was given, and in about ten days the child was convalescent.

It will be noted that the abscess in the right tonsil was lying close down on the capsule.

d. So-called parenchymatous inflammation of the tonsil, involving all the tissues of the tonsil and producing an acute, large swelling of the tonsil.

e. Peri-tonsillar inflammation affecting the cellular tissue outside the capsule of the tonsil and of the surrounding palate. This often results in a large peri-tonsillar abscess, which is commonly known as quinsy.

f. There is another acute condition which I have found extremely common in this district, namely, Vincent's angina. The authorities usually divide this into two, the mild and the necrotic. I have never seen the necrotic type, but I have seen upwards of one hundred cases during the last eighteen months of the mild variety, and the typical spirillum and fusiform bacillus of Vincent were found in every case examined. These cases have resembled diphtheria of the mild type, but they differ from diphtheria in that one always finds a broad, shallow ulceration, usually oval in outline. This may involve the palate and the pillars. A pseudo-membrane of a whitish colour is usually found covering parts of the ulcer. This can be removed without causing bleeding, and is easily detached. The condition is not accompanied, as a rule, by any severe symptoms beyond mild sore throat, some malaise, and a moderate glandular enlargement. All the cases I have found readily amenable to simple local treatment, combined with some general treatment. In a certain number of cases one found Vincent's angina along with diphtheria.

g. **Diphtheria.**—This is an affection of the epithelium of the surface of the tonsils and their crypts, and is characterised by ulceration and the formation of an adherent false membrane, which bleeds on removal, and is accompanied by profound general symptoms which need not here be enumerated.

h. Acute Syphilis—primary or secondary.

i. Acute Tuberculosis of the tonsil, which I have never seen alone.

In only two of these cases is operation warranted, namely, peri-tonsillar abscess and intra-tonsillar follicular abscess.

Chronic inflammations of the tonsil.—There is an enlargement of the tonsil in childhood which I do not

consider inflammation in the true sense of the word. One sees during early dentition moderately large pale tonsils without any inflammatory reaction in the pillars, which is due, in my opinion, to a hyperplasia of the lymphoid elements or follicles of the tonsil, caused by an increased amount of work thrown upon the tonsils by the debris—bacterial and other—caught in them from the drainage of the nose and particularly the gums. In these cases it is a mistake, in my opinion, to remove the tonsils, unless they have become so large as to cause difficulty in breathing or swallowing, or to prevent proper æration of the middle ears through the eustachian tubes.

a. Chronic lacunar tonsillitis.
b. Chronic follicular tonsillitis.
c. Chronic interstitial tonsillitis.
d. Chronic tuberculosis.
e. Tertiary syphilis or gumma.

New growths are a class apart.

Chronic Lacunar Tonsilitis.—Here the crypts or lacunæ are very prominent, irregularly dilated, and probably enlarged so as to take up more of the gland than normal, and to extend practically to the capsule. The superficial layers of the mucosa are increased in number, as well as the size of their cellular elements. The tonsil itself looks like a marine sponge with its gaping lacunæ. The lacunæ may or may not have cheesy or creamy deposit at their orifices. In many cases the deeper parts of the lacunæ are dilated and contain almost solid lumps of this cheesy material. This material is extruded usually by the action of the muscles surrounding the tonsil, and of the muscle in the tonsil substance itself, if that be present. Partially extruded masses caught in a narrow part of a lacuna may cause severe pain in the tonsil itself or referred pain in the ear, which can be relieved at once by instrumental removal of the masses. This debris contains altered mucus from the mucous glands of the tonsil and broken-down, cast-off epithelial cells, and cells from the lymphoid tissue of the tonsil which have passed through the epithelium. It also contains a large number of various bacteria. There is a possibility that food may be mixed up with this debris. These tonsils will be found to have a smaller number of true lymphoid follicles than normal, and their interstitial tissue increased and toughened.

This is partially the reason for the gaping of the lacunæ. These tonsils are usually found in adults. They are a constant source of danger to the possessor of them, owing to the crypts becoming culture tubes. Periodic cleansing of them is said to be good, but, owing to their tortuosity, it is impossible to cleanse them out thoroughly. Slitting them up by any form of curved knife cannot possibly obliterate them. It is this form of tonsil that requires total ablation. Many authorities look upon these tonsils as the starting point of recurrences of coccal diseases, rheumatism, kidney disease, heart disease, arthrites, etc. A few authorities hold that rheumatic fever and scarlet fever

at least, commence in such tonsils. Others again say that the tonsillitis found with these diseases is a concomitant and not a cause.

While on this, one might as well speak of the supra-tonsillar fossa and the plica triangularis.

The plica triangularis, which reaches from the upper part of the anterior pillar and is attached to the anterior pillar and the side of the tongue back to the posterior pillar below, is usually, in healthy tonsils, found to cover the lower half of the tonsil, and looks like a leaf of reduplicated mucous membrane, forming a "watch pocket" with the tonsil. In many cases the forward growth of the tongue and the development of the fauces have carried the plica forwards until it is a mere band lying internally and posteriorly to the anterior pillar. In the other cases where the inferior attachment still extends almost to the posterior pillar this "watch pocket" may prevent the extrusion of the contents of the lacunæ and cause trouble. Again, food and debris may be caught between the tonsil and the plica. The so-called buried tonsil usually has a well-defined plica triangularis, and the reason why the buried tonsil is dangerous is because the crypts cannot themselves empty naturally. In these cases, in a large majority of instances, I believe that the careful removal of the plica will do all that is required. This must be done in the early years of life, and not left until well-marked lacunar tonsillitis is established. Even where total ablation is performed the plica must be carefully removed.

The supra-tonsillar fossa, and I am considering that it is outside the tonsil, lies above the tonsil, between its upper pole and the hood-shaped vault of the sinus tonsillaris formed by the two pillars. This fossa passes outwards, backwards, and, thirdly, either upwards or downwards, depending on the size of the tonsil. Into it open some of the superior lacunæ of the tonsil. It is only when this fossa turns downward behind an enlarged upper pole of the tonsil that it is dangerous, for then it forms a receptacle for the debris already spoken of, and this may be one of the causes of peri-tonsillar abscess, though certainly not, in my opinion, the cause of all peri-tonsillar abscesses (quinsy); therefore, in this type of supra-tonsillar fossa, enucleation of the tonsil will relieve the condition.

Chronic Follicular Tonsillitis.—This follows on the acute type. It is evidenced by slight or great enlargements of the tonsil, but the tonsil is reddish in appearance instead of pale, and the anterior pillars have a characteristic appearance. The mucous membrane covering the pillars is a dark red to blue colour, which is probably due to dilated blood vessels and inflammatory infiltration of the lymphoid elements in the anterior pillar. The crypts or lacunæ are not prominent. The gland is soft, owing to an increase in the cellular or follicular part of the tonsil. These tonsils are affected periodically by colds, affecting the nose and mouth, and cause fullness and aching in the throat or ears. They may be said to be filters which have become choked and infected. Organisms,

instead of being destroyed by the cells of the gland, live in a quiescent form until some exciting cause comes along that stirs them into activity, or there may be no organisms present, but the chronic condition may depend on a chronic inflammation somewhere in the area drained by the tonsil. Therefore, in dealing with operative procedure on such tonsils one has to consider the fountain head of the trouble and carefully examine the nose, the naso-pharynx and the mouth, including the teeth. Once these areas have been put into good order and the tonsils are found to remain in their affected state, operative measure may be considered.

Chronic Interstitial Tonsillitis.—Here there is, of course, an overgrowth of the fibrous elements of the tonsil, producing in the first instance in young adults, the large tough pedunctulated tonsil. This is the kind that the general practitioner scores many a triumph over, for their removal is easy. But th chronic interstitial tonsillitis may produce the small hard sunken tonsil. The crypts are distorted, their lumina interfered with, and secretions retained. Retained secretions being always favourable to bacterial growth, these tonsils should be very carefully enucleated. This latter form of interstitial inflammation affects largely adults of all ages. Here the capsule may be very thick indeed, and so closely interwoven with the pharyngeal fascia as to make enucleation extremely difficult.

Chronic Tuberculosis.—There is nothing particular about the appearance of the tonsil, except a pallor which they share with the rest of the fauces, but we suspect the condition from the character of the cervical glands which are affected from them. The mode of infection of the tonsil is unknown. Whether tubercle bacilli get into the crypts and through the epithelium of the tonsils into their substance, or whether they reach the tonsils from the nose and teeth by way of the lymphatics, or whether they are carried there by the blood-stream from some other focus of infection I have never been able to satisfy myself from the literature I have read. Certain it is that the removal of the glands of the neck in these cases must be accompanied by total removal of the tonsil.

Tertiary Syphilis, Gumma.—This is not easily detected in its earlier stages. The tonsil becomes enlarged, and except for its size, its smoothness, and the absence of signs already indicated, one could not diagnose it; but when the gumma begins to affect the epithelium, the epithelium becomes stretched and thin, and of a purplish colour which is usually limited to its own area. The history given by the patient and Wasserman reaction will help us in our diagnosis. Operative interference should not take place at this stage, but the gumma should be reduced by anti-specific treatment, injections and internal medicine, and when the Wasserman reaction is negative, the tonsil affected should be enucleated, because such tonsils may become the site of a malignant growth, that is on the supposition that parts of the body, that normally undergo atrophy, which become infected with gummata, are specially liable to develop malignant disease.

I do not intend to go into the question of malignant disease of the tonsil, for there are no special varieties which affect the tonsil alone.

Cysts of the tonsil apart from hydatid cysts are of two varieties —the developmental and the acquired, the latter being generally due to obliteration of part of the lumen of the crypts or of the duct of a mucous gland. These cysts, of course, should be got rid of by, in the first case—enucleation, in the second case, free opening with the knife or punching.

Angiomata.—I have never seen, but they will probably be found in rare cases. Removal of these will give the operator some anxiety owing to the difficulty, I should imagine, of controlling hæmorrhage.

Regarding the pathology of the tonsil, I wish now to quote several authorities, and here I may state that I regret not having Brieger's book as I have been unable to procure it.

Barnes says: "Practically all the pathological conditions in the tonsils—excluding neoplasms and specific infections—are brought about by the peculiar anatomical structure of the crypts, and a tendency to retention of the cellular debris." "This is due to the tortuosity and depth of the crypts, and to the fact that the mouths of these may be partially closed by the plica triangularis or by the hood-like superior wall of the supra-tonsillar fossa. The constant irritation produced by the retention of secretion, and the growth of organisms cause the tonsils to grow rapidly. There is a degeneration of the cryptic epithelium which does not commence until the sixth month of infancy. The debris consists of lymphocytes polynuclear leucocytes, exfoliated epithelium, cholesterine crystals hyaline material, and large numbers of bacteria."

He points out a fact well recognised by specialists, namely, that the sunken tonsils may have their crypts full of this debris, and yet appear healthy to the casual observer. Of the bacteria present the streptococcus is the most frequently found. He says that the tubercle bacillus is found in a small number of cases without infection of the tonsil. He does not give the different varieties of chronic tonsillitis as I have given them, but he classes them under the one heading. He gives as separate classes chronic suppurative tonsillitis where small chronic abscesses are found in the parenchyma of the tonsil. This I would call chronic follicular abscess. He says that cyst of the tonsil is due to occlusion of the mouth of a crypt, and the consequent dilatation of the blind sac by the accumulation of débris.

Calculus of the Tonsil he mentions, but does not give its cause. Hyperkeratosis of the tonsil, he says, is due to callus formation of the epithelium of the crypts. I, myself, have seen one marked case of that, and assisted at the operation on it. Both tonsils, in a young man of 24 years, were studded with thorn-like projections from the crypts. The tonsils were removed by morcellement, but

I think now that a better method would have been to enucleate them so as to be quite sure that all the cryptic epithelium was removed. Barnes says that this condition arises in young adults during the retrogression normal to the tonsil at that age. The case I saw was one at the age of 24 years, and the tonsils were large and causing considerable discomfort to the patient.

Regarding primary tuberculosis of the tonsil, he says the bacilli probably gain entrance through the attenuated epithelium of the crypts, whence they pass through the tonsil, to the glands without producing lesions of the tonsils themselves. This cannot be so in all cases for definite tubercles have been found in the tonsils apart from miliary tuberculosis. He issues a note of warning that the cervical glands may be infected from the pharyngeal tonsil. He states that six per cent. of all faucial tonsils examined have been found to contain tubercle bacilli. He agrees with most authorities that tonsils should be enucleated at the same time as glands of the neck are removed.

Morell Mackenzie discusses chronic tonsillitis under the heading of enlarged tonsils. He says that some cases of enlarged tonsils are congenital. As I have said above, I doubt whether this is really chronic tonsillitis. I prefer to look upon it as hyperplasia of the gland.

The effects of large tonsils are:—

1. They cause difficulty in breathing and swallowing.
2. They interfere with hearing, not by pressure as I have said, but by spread of inflammation through the mucous membrane to the eustachian tubes. I prefer to think that this latter effect is brought about by affections of the pharyngeal tonsil. In his description of the pathology, which is very meagre, he says that sections may show thickening and induration of the connective tissue or softness and friability of the organ, presumably caused by increase in the lymphoid elements.

He says that the lacunæ may be dilated, and their walls thickened whilst their cavities are filled with viscid mucous, which may be caseous or calcareous. The enlarged tonsils may at the age of puberty regain their normal size. When hyperplasia takes place in adult life, it is seldom productive of evil, except occasional local trouble. In the light of modern research and clinical experience, one cannot possibly agree with this. Again, he says that after 30 a progressive diminution takes place in the size of the tonsils, but we know now that the retrogression begins at puberty, or earlier, unless there are inflammatory changes going on in the glands. Many cases of large cryptous tonsils have been found in patients up to 50 years of age but rarely over that.

In discusing tonsillectomy, **Richardson,** of Washington, inveighs against the practice of blaming the tonsils as the cause of numerous systemic infections, and asks that a thorough search be made for other sources of infection when the tonsils appear normal, without proceeding at once to tonsillectomy. Even the removal of partially

infected tonsils does not rid the patient of his systemic infection in all cases.

Swain says that the tonsils show temporary enlargement during the eruption of the molar teeth, owing, apparently, to a transitory increase in the lymphoid elements. This is a physiological circumstance, and is not in itself a cause for removal. Unless these tonsils are large enough to be obstructive, their size is not an indication for removal. Enlargement of the tonsil itself is not a menace. He doubts if regional or systemic infection is caused from the lacunæ unless there is an accumulation of debris. Infection, he says, does occur, however, from small chronic follicular abscesses where the gland resistance has been overcome. He does not think it fair to enucleate tonsils simply because they might contain foci of infection. Frequent attacks of simple sore throat are not in themselves a reason for enucleation. I can bear this out myself, for I have seen quite a number of cases of acute sore throat occurring after the careful enucleation of the tonsils. He pleads for the retention of the capsule because it is an effective barrier to absorption even long after removal in cases of pharyngitis. In this, he strongly supports Makuen. Of course, at the time of the operation they both hold that the removal of the capsule makes the liability of cellular infection a distinct danger.

Makuen says, that while all excessively diseased tonsils should be enucleated, it is probably safe to say that 80 per cent. of enlarged tonsils do not contain foci of infection.

Henke in his "Experimental Observations on the Tonsil," says that tonsillitis occurring either alone or in association with some other disease such as Rheumatism or Endocarditis is seldom due to infective material gaining entry through the surface of the tonsil, but is the result of a secondary infection conveyed by the lymph stream. The portal of entry being, in most cases, somewhere in the nose, the accessory sinuses, or the mucous membrane of the mouth. This view is in no way incompatible with the well-established fact that severe general infections do take their origin from the diseases of the tonsil. My comment upon this is, however, that if this be true—and I am inclined to think that it is—removal of the tonsils will not necessarily cure diseases such as Rheumatism or Endocarditis. Removal of the tonsils may be necessary from the fact that they have become diseased, but the medical man must also treat the origin of the trouble in the nose or mouth.

G. B. Wood, in March, 1914, says that there must be destruction of the epithelium of the crypts before organisms can get in. This destruction takes place as the result of the toxines elaborated by the organisms in the crypts. He says he was able to demonstrate streptococci passing through the epithelial gaps and making their way towards the germ follicles, where numerous small abscesses arise and grow until they rupture into the crypts; but he says that the tubercle bacilli can pass through the unaltered epithelium. It is probable that the sup-epithelial adenoid tissue of the gastro intestinal tract including the tonsil is of importance in the production of immunity. It is doubtful whether the tonsil ever

carries out this function to a sufficiently great extent to make its retention essential.

Ashby in the same Journal says that enlargement of the tonsil is an attempt, on the part of nature to supply the tissues of the body with lymphoid cells which are for some reason or other deficient.

Goerke holds that many general affections, and those of various organs appear to take their origin in the tonsil, but not to the extent that some authors maintain. **Passler** stated that more than 30 different diseases are attributable to the tonsils, but **Goerke** is certain that it is difficult to prove this. The question is yet to be decided as to whether the tonsils are affected at the same time or whether they are the origin of the infection. It is possible that recurrences of the different rheumatic troubles and some septicæmic troubles may arise from chronic tonsillitis.

Hoffmann, senior, likens many of these tonsillitis cases to choked filters which are no longer of any use to the body, and are in fact a source of, at least, recurrences, of certain diseases.

Goerke would remove tonsils which, by their hyperplasia, interfere with speech, swallowing and breathing, and the ears, also all tonsils which have pathological conditions that have hindered the normal involution of the organs. It is in these latter cases that total extirpation is desirable.

Goerke appears to limit enucleation to the period after 12 years of age, and only where the tonsils are manifestly diseased would he do it before that age. Amputation of the tonsil is sufficient in simple hyperplasia interfering with breathing, etc. This will not prevent the growth of the tonsil until the period of involution begins, and if then involution does not proceed normally, enucleation could be considered.

In my own personal opinion (MacGibbon) this is reasonable as it insures that a certain amount of the tonsil is retained to keep the shape of the fauces, obviating damage to it, and leaves lymphoid tissue to do the tonsils' normal work which, as said before, ends at puberty. It is the experience of many people that the lymphoid tissue in the pillars and palate, and of the adjacent part of the lingual tonsil will grow after enucleation before the age of puberty, and this probably explains the recurrence of what looks like a tonsil after enucleation.

Passler states that recurrence is only impossible in the case of adults.

Goerke emphatically states that these recurrences after enucleation in children are the regular thing, showing that the phenomena of primitive hyperplasia in lymphoid tissue of that area follows the need of protection, and this goes on until the physiological processes of involution begin.

Regarding the removal of tonsils for quinsy, **Goerke** says that many of the cases are cured by careful attention to the teeth, but once the relation of rheumatism and nephritis to chronic tonsillitis —that is when every other source of infection has been eliminated— has been established, tonsillectomy guarantees the best result.

Goldmann in 1914, said that chronic tonsillitis was characterised by the formation of blockage in the tonsils. By this I would understand that he looks upon the tonsil as of definite use to the body. The blockage is exhibited by a collateral inflammation of the lymphatic glands of the neck.

St. Clair Thomson in his recent book describing the pathology of the tonsil, divides chronic tonsillitis into three: (1) Lacunar types in which the crypts are more marked, and contain a variable amount of mucus and altered epithelium undergoing fatty degeneration; (2) chronic parenchymatous hyperplasia in which the tonsil is soft and friable from overgrowth of the lymphoid tissue; (3) chronic fibroid degeneration. In this latter type the increase in the connective tissue may lead to the cutting off of the crypts with the formation of cysts. He notes a point which I have omitted, namely, that the tonsils, as a result of inflammation, may be adherent to one or both pillars. He states that the crypts vary in number from 20 to 30, while others say that there are about 16. In discussing the relation of rheumatism to the tonsils, he says it is uncertain whether the so-called rheumatic diathesis simply predisposes the tonsil to infection, or whether the tonsil acts as a portal of entry for the rheumatic poison. Fletcher Inglis, he says, suggests, that rheumatic pains are a phenomenon of septic infection in the tonsils. There are no clinical signs by which tuberculosis of the tonsils can be recognised. A gland which has undergone hypertrophic degeneration, with much of its lymphoid tissue destroyed and often riddled with septic secretion is no longer a defence, but is a culture-bed for disease.

Phillips in his article on "The Oropharynx," says that infection from organisms which are always to be found in the crypts follows upon some exciting cause, such as chill, injury to the epithelium, or depression of the sympathic which interferes with the resisting power of the epithelium, and of the diapedesis of white corpuscles and leucocytes. **Wright** supports this view.

Dr. Anna Goslar in "Practical Medicine," of 1914, says that the lymphocytes and plasma cells emigrate as the result of pathological influences. I suppose she means into the crypts, or it may be if the excretion theory holds good, that they emigrate and carry with them organisms and broken down cell material brought to them from the nose and mouth.

Ashby in the same book, says that children with enlarged tonsils and adenoids have fewer lymphocytes in the blood than normal, and at the age of from 2 to 5 years when the tonsils are enlarged and the thymus is decreasing, to make up a deficiency Waldeyer's ring takes on increased activity.

I cannot subscribe altogether to this view, but incline to think that the increase in the size of the tonsils is due to organisms of infection somewhere about the mouth and nose. The editor of the "Practical Medicine Series," 1915, says that while all extensively diseased tonsils should be enucleated, it is probably safe to say that 80 per cent. of enlarged tonsils do not contain foci of infection, and, therefore, do not need to be removed.

Gardiner in "Practical Medicine Series," 1916, says that chronic cervical adenitis with no other obvious source of infection means that the tonsils are infected, that the size of the tonsil makes no difference as to its infectivity, that the small fibrotic variety is more likely to be dangerous (here I presume he means in adults). Organisms are often present in the deepest parts of the gland, and, therefore, enucleation is the only means of getting rid of them.

In the 1917 "Practical Medicine Series," the editor calls attention to the fact that certain joint troubles are due to a diplococcus to be found in the tonsils, presumably in the crypts, or latent in the follicles, and that this would account for recurrences. Personally, one has to remember that there are other tonsils in and around the throat, and that there are other sites where lymphoid tissue is to be found, in the alimentary tract which may be similarly affected by organisms likely to produce these arthrites.

Layton in "A plea for Fewer Tonsil and Adenoid Operations," says that when we find the tonsils enlarged, we must not at once infer that they are the cause of any surrounding inflammation. Flat fibrotic faucial tonsils, with each crypt a bag of pus, are, however, a cause of repeated sore throats, and should be removed. Such tonsils are not common in children. We should remove any other source of septic infection before touching the tonsils. The teeth and nose should be attended to, and nasal breathing taught.

While **Pybus** thinks that infection of the tonsil comes more often from the free surface, most authorities as far as I have read agree that infection more often comes from the nose and throat.

Poynton, Payne, Beattie and **Dixon** have found the rheumatic organisms in the tonsils, but they do not state whether the disease begins there or not.

Richardson in the "Medical Annual" of 1916 objects to the frequent removal of tonsils, which show no macroscopic evidence of disease. He states that many cases of rheumatism have recurred after a total extirpation of the tonsils.

OPERATIONS ON THE TONSILS

Without repeating what I have said I will enumerate these, and make brief comments.

Firstly, I divide the operative procedures into three, namely, radical operations, simple removal, and minor instrumental interference with the region of the tonsil. Taking the third first, this includes incision into the tonsil, slitting the crypts, freeing pillars from the tonsil and removing the plica triangularis. As I am dealing with chronic conditions only in this paper, I doubt if ever incision into the tonsil is justifiable. It is used in acute conditions to blood-let and effect resolution of the inflammation, or to open abscesses in the tonsil, but in chronic conditions it does not seem to be applicable at all. Slitting of the crypts was, and is, done to allow of the escape of retained débris in those cases found in adults when the lumen of the crypt, or crypts has been constricted by inflammation of the epithelium with adhesions or by chronic

fibrosis of the body of the tonsil. Frankly, I do not like this method. What is to ensure that the incised crypt will remain patent or that worse adhesions will not follow? Secondly, what cutting instrument will follow the windings of a crypt to its termination, and if the crypt is branched, how can we be sure that we can get into all the branches? I have never used this method at all except to open a retention cyst to give immediate relief. I have often used a right-angled scoop to remove caseous masses from the crypts which were causing irritation or pain, but these I look upon as temporary measures. I do not think the epithelium should be injured in children because we are likely to cause fresh adhesions, and make the condition worse than before. Freeing of the adhesions between the anterior pillar and the tonsil is a simple operation and should be done where the adhesion produces a pocket in which debris from the tonsil and the mouth will collect and a bacterial culture bed form. The same applies to the posterior pillar. Where a large plica remains in the youth or the adult, it acts detrimentally in two ways, it prevents extrusion of the secretion of the crypts, and also forms a "watch pocket" with its mouth upwards for the retention of debris. The removal of this I verily believe will relieve the patient of his symptoms in many instances without the need of more radical measures.

THE SIMPLE OPERATION ON THE TONSIL, OR TONSILLOTOMY.

These operations should be carried out in children up to the age of 12 years. In the cases of simple hyperplasia or chronic congestive hyperplasia (where there are no follicular abscesses and where the crypts are healthy) the tonsils should not be operated upon unless they are causing mechanical obstruction, first to nasal breathing or swallowing, and secondly, where they cause tubal obstruction. Here I may state that removal of adenoids is, in my experience, quite sufficient. The chronic congestive hyperplasia, which is after all a mild chronic parenchymatous inflammation, is most often seen in the so-called pedunctulated form, and it causes obstruction, and therefore, should be removed by simple tonsillotomy. The small tonsils in this condition do not need removal, but attention to the nose, naso-pharynx, and teeth, will practically always bring about an alleviation of the trouble. I am against the major operation in these simple hyperplasias, firstly, because I deem them unnecessary, and secondly because in young children injury to the fauces is almost certain and deformity from these injuries or from subsequent adhesions will interfere in after life with the development of the throat and of the pharynx. I repeat again that the breadth of the fauces is meant by nature to aid in directing muscular action and provide a wide grip upon the bolus of food in swallowing. The craze for the major operation has, as far as my reading goes, taken hold upon the younger and more radical men branch of the profession. It is on a par with colectomies performed to relieve constipation, ovariotomies to relieve supposed pain in those organs, thyreoidectomies for muscular tremors and cardiac irritation. I, myself, have passed through that stage, but have come to the conclusion that one must

be thoroughly justified before doing the major operation, and I am not yet too old to have become over-conservative or afraid of more radical measures. Of course the tonsils may grow again, that is because they have a function to perform. Even then we have always involution setting in at the time already stated. Fear may be expressed that tonsillotomy may cause obliteration of the mouths of the crypts left, but as secretion is supposed to be constantly extruded from the crypts and regeneration of the mucous membrane to be very rapid in the mouth, this fear has small foundation. It must also be borne in mind that when we remove the tonsils in childhood, some other part of the lymphoid tissue of the throat may have to take on their function, and we may find small or large nodes in the pillars or hyperplasia of the lymphoid masses in the lateral walls of the pharynx or of the lingual tonsils, and the troubles caused by these are so real, though they are often ignored, that they must cause us to think seriously before performing radical operations on the tonsil. The craze for total removal of the tonsil in cases of numerous systemic diseases is, to my mind, the outcome of woeful carelessness in diagnosis. The tonsils have been blamed as being the cause of practically every disease known to us. This has come about largely owing to want of co-operation between the surgeon and the physician. It is partly due to want of confidence in one another, partly fear of public opinion regarding our powers of diagnosis, and partly the cost of treatment.

I omitted the operation of Morcellement on the tonsils. I do not believe in this, I have never done it, and I do not think it produces the effect we desire.

THE RADICAL REMOVAL OF THE TONSILS, OR TONSILLECTOMY.

This operation I would confine almost solely to adolescents and adults. In children it is justifiable only in tuberculosis, and where there is manifest degeneration of the tonsil from bacterial infection of the lymphoid tissue or the crypts. These cases can be easily diagnosed by a skilled observer. In adults, chronic lacunar tonsillitis, with great tortuosity of the crypts, retention of secretion, and manifest inflammation of the organ, can only be treated by enucleation. In chronic follicular tonsillitis with tiny abscesses in the lymphoid follicles, enucleation is desirable. This is evidenced as a rule by points of pus appearing at intervals in the mouths of the crypts. The abscesses usually burst into the crypts and there is sometimes chronic enlargement of the cervical glands. During exacerbations of these cases the cervical glands are always tender. Radical removal is also indicated in cases of neoplasm and of chronic specific disease. The latter because it is supposed to be frequently followed by malignant disease. The period of involution of the tonsil is from 12 to 30 or 35 years of age. After 35 years all chronic inflammations of the tonsil should be carefully inquired into, and when efficient treatment of the nose and mouth has been carried out without improvement in the condition of the tonsils,

these should be enucleated because it shows that they are inherently infective.

PREPARATION FOR REMOVAL OF TONSILS.

In many clinics, notably those in America, the coagulation time of the blood is tested, and if long, something is introduced into the body to shorten the coagulation time. Lime Salts in the form of Calcium Chloride, or Lactate, are given for some days beforehand. Horse Serum has been injected or given by the mouth 12 or 24 hours before to increase the amount of the coagulating bodies in the blood. Proprietary preparations as coagulen have also been introduced. Extract of the Pituitary body has also been used to prevent post-operative hæmorrhage. I have used the last to a very great extent, and can bear testimony to its good effect. I have given it the night before, half an hour before the operation, 10 minutes before and 10 to 20 minutes after the operation, and have come to the conclusion that the best time to use that substance is shortly after the operation, when the patient is getting over the depression caused by the anæsthetic. To my mind, its action is produced by causing constriction of the peripheral blood vessels.

The best time to operate is early in the morning, as the patient can get well over the effects af the anæsthetic and the risk of hæmorrhage, before night, when he should get a good sleep. The usual preparations for all operations under anæsthetics should be carried out. In boys, bleeders should be watched for. In young women and adult women, operations on the tonsils should not be performed during the menses, as the coagulative power of the blood is, at that time, probably lessened, and the risk of shock from the anæsthetic greater. It goes without saying that the teeth and mouth generally should be carefully attended to for some days at least before the operation. The patient should be in the hospital for at least 12 hours before the operation, and should not leave the hospital for at least 48 hours afterwards. This particularly applies to enucleations, though it should also apply to the simpler operation. The risks of hæmorrhage, local sepsis, general sepsis, and aural infections are well enough known to the specialist to make him insist upon all these patients being treated in the hospital. The haphazard way of bringing in patients half an hour before the operation in all sorts of weather without the condition of the mouth being attended to, the condition of the patient being inquired into beyond a cursory examination, and the sending of them home four hours or less after the operation, is a bad state of affairs. No medical man would have his own child treated in that way. But the present condition of affairs in our hospitals practically prevents our carrying this out, though we know quite well it should be done. In my hospital practice here, I have done as many as 30 tonsillotomies in a morning, and I have, like most others, had my cases of hæmorrhage occurring at home, up to 24 hours after operation, of septic glands and suppurative otitis media. I had one case of septicæmia where a child's life was nearly lost. There must be many other cases where local sepsis has produced deformities and adhesions which will affect the child or the patient in after years, and in these

days when ulcerative Vincent's Angina is so apt to complicate throat troubles, greater care of these patients should be demanded of us. Without being selfish, I have come to the definite conclusion that operations on the tonsils, as far as their necessity, their performance, and their after-treatment are concerned, should be in the hands of specialists or their assistants, and not left to house surgeons or physicians who have not had special training in this work.

ANÆSTHESIA

In operations upon the tonsils I use a general anæsthetic for all cases of tonsillotomy. I have used local anæsthesia in adolescents and adults in numerous case for enucleation.

Anæsthesia in Children.—As most of the operations upon the tonsils in children are of the simple variety, and can be done with the guillotine, short anæsthesia only is required. Practically all my cases in the out-patient department of the Christchurch Hospital have been done under **nitrous oxide gas** alone. This works excellently, and is infinitely safer in the hands of an inexperienced administrator, and is easy to administer. One has ample time to remove the tonsils, adenoids, and the posterior ends of the inferior turbinates if required. The patient is placed flat on the table, looking up to the ceiling, and a Doyen gag inserted in the usual way. The head is not put over the end of the table. There is never any need for that, and we obviate the risk of blood getting into the eustachian tubes. When the operation is completed the child rapidly regains consciousness, is made to sit up and spit the blood out into a basin. There is practically no risk of inspiration of blood, as the period during which the swallowing reflex is lost is only a matter of a few seconds, while the analgesia lasts from a minute and a-half to three minutes, depending on the dose. Even though the patient, towards the end of the operation, appears conscious, he does not feel anything as a rule. Many a time I have asked youths and young adults afterwards whether they felt anything, though they appeared very conscious towards the end of the operation, and I have always been told that they felt nothing. In one or two cases we found we could not get the patients anæsthetised at all. This occurred in adults, and I cannot explain the reason, for we have no time to inquire into it. Occasionally, but rarely, we get a fractious child whom it is impossible to anæsthetise. In one instance, a child of about five years of age developed acetonuria. This was the first case I have ever heard of following gas. A medical brother told me of another case he had heard of after administration of gas for the removal of teeth. In both cases the gas was manufactured in New Zealand, and it was thought that the manufacture was faulty.

Ethyl Chloride or Methyl Chloride, or some similar compound or mixture of these, has been used extensively. The duration of the anæsthesia is short, and seems to answer very well. I have given a large number of cases of Ethyl Chloride myself as a house surgeon, and also of Somnoform, and the results appeared excellent,

but too little is known about these drugs for them to be placed in the hands of the ordinary non-specialist anæsthetist.

Ether.—This also is an excellent anæsthetic. It takes longer to produce the anæsthesia, and the patient takes longer to come out of it. Unless preceded by the administration of atropine, it causes increased salivation, which interferes with our vision of the tonsils during the operation—a hopeless state in enucleations. Given by the open method, or with the addition of Oxygen, the congestion of the fauces is very much less, and therefore hæmorrhage less and after-sickness very considerably reduced.

Chloroform.—For the major operation and for the simpler operation in adults this is absolutely the best general anæsthetic of all, but the administration of chloroform requires more skill than the administration of any of the others, and I am sorry to learn that its administration in Edinburgh is not so frequently carried out now as it used to be, and am likewise astonished to find that the London Schools are taking to chloroform instead of ether. The administration of chloroform for throat surgery is the most difficult anesthetic there is, but, given a good anesthetist and good chloroform we get the ideal conditions for operating. The patient goes under quietly and without fuss, there is no struggle, there is no congestion, there is a complete relaxation of the parts, there is no increase of saliva, and there is less hæmorrhage than usual, because of the slight depression of the circulatory system. The anæsthetist can work quietly with a nasal tube and a small bellows apparatus, and can, at the same time, assist in the operation. The patient is put just over into the third stage. A short stoppage of the anæsthetic brings back the swallowing reflex or the swallowing reflex need not be abolished, and yet the patient seems not to feel pain. I have seen this repeatedly. One or two minutes after the operation, which may take ten minutes or quarter of an hour, the patient has been talking to us. I saw the best example of that in a private hospital in London, where the patient was kept under for nearly half an hour, and in less than three minutes after the completion of the operation the patient was talking to me. It comes to this that there is more in the administration of chloroform than the consideration of the four stages.

Gas Analgesia.—For adolescents and adults this is the best agent for removing tonsils in their entirety. I have used nitrous oxide gas alone, and nitrous oxide gas and oxygen from a special apparatus. The patient is placed sitting in a chair with the head in an easy head rest. The anæsthetist stands behind the patient and delivers the gas by means of a double nose piece from the usual bag container. A Doyen gag, or a double gag, is placed in position and held there by the anæsthetist who also steadies the head. The patient breathes through the nose consciously. It requires some experience on the part of the anæsthetist and the surgeon to know the exact quantity to give. The patient is in a drowsy condition, but can answer questions if spoken to loudly. The face is slightly cyanosed, but the respirations are not stertorous. The advantage

of this method is that the operator can sit in front of the patient and work at the tonsils just as though he were in his own surgery, and the swallowing reflex being present, the patient can spit the blood out as it flows. If the anæsthetic goes too far, the patient will slide forward in the chair. The gas must be given under pressure, to ensure it passing through the nose into the larynx, etc.

Local Anæsthesia.—I have tried several methods, but the method I prefer is the following. The patient is placed in the sitting position, no gag is used, a tongue depressor is introduced, and the fauces, including the tonsil, both pillars, uvula and lingual tonsil are freely painted with 12½ per cent. cocaine and 1:5000 adrenalin. The posterior pharyngeal wall, and the lateral pharyngeal walls are similarly treated. The brushes I use consist of cotton wool held in long ovum forceps. The cotton wool is squeezed so that no drips will come from it. The drips are the dangerous feature of this procedure. The mops are kept pressed against the different areas for about ¼ of a minute. I begin with the uvula as being the most sensitive part of the fauces, and then I paint around the circum vallate papillae of the tongue. After applying the anæsthetic for ten minutes, I expect all the mucous membrane will be numbed. The next procedure is to grasp the tonsil in hooked forceps and pull it towards the middle line to steady it. I then take a large dental syringe with a small needle, and inject between the posterior pillar and the tonsil, a solution containing novocaine ½ per cent., and adrenalin 1:20000. The anterior pillar is then treated in the same way, but the needle is pushed gently onwards following round the outer surface of the tonsil, and the anæsthetic injected in and around the capsule. 2½ to 3 drachms can be injected in and around each tonsil with safety, though I rarely use more than ¾ drachm to each tonsil. Five minutes should be allowed to elapse before the operation is commenced. Other modifications I have used are: (1) A quarter per cent. Eucaine with the same strength of adrenalin. I gave this up because it produced sloughing afterwards; (2) I tried a solution of urea and quinine, but gave it up because I never got satisfactory anesthesia. Possibly this was because I did not use a sufficient quantity; (3) lately owing to the difficulty of getting novocaine, I have been using neocaine in the same strength as novocaine, and have secured excellent results. Cocaine I make a point of never injecting at all as I consider it dangerous. One would be putting into the body a drug that is uncertain in its action. Once I injected it into a hand, using not more than 3-16 of a grain, and the patient collapsed seriously.

Barnes, for general anæsthesia, prefers Ether with or without the accompaniment of Nitrous Oxide and Oxygen. I still maintain that Chloroform is the ideal anæsthetic, but it requires an expert to give it satisfactorily.

W. H. Roberts, in the "Laryngoscope" of February, 1914, performs Tonsillectomy in the upright position under ether. The advantages, he says, are the ease with which the field of the operation can be illuminated, the ready accessibility of the parts, the

freedom with which the assistant can hold instruments and sponge the field of operation, the simple control of hæmorrhage, the thoroughness with which the field can be examined for tonsil shreds and bleeding points, the ease of control of the patient's head. Roberts admits that it requires an expert and one accustomed to the operator to administer the anæsthetic. There is no question that is the best position if we can get an expert to give it.

Of operations in the tonsil I shall describe those of tonsillotomy and tonsillectomy only. The patient should be prepared in the same way as for a major operation, and is admitted the night before operation. It is always advisable to see that the teeth are in good order before the operation, and if necessary the nasal douche and a throat spray given for some days beforehand. Immediately before the operation, the patient's mouth should be well sprayed with a solution of thymol or peroxide. If there is any doubt about the question of excessive bleeding, calcium chloride should be given for some days beforehand, and an injection of horse serum may be given the night before.

OPERATION OF TONSILLOTOMY.

As I have to do this operation without the assistance of an expert anæsthetist, I usually have the patient lying flat on the table. As I have said, the operation is used for cases of simple hyperplasia causing obstruction, and in chronic congestive hypertrophy in older people causing the same symptoms. A Doyen gag is inserted, and in the case of children gas is administered. I use an ordinary obtuse-handled MacKenzie Guillotine. The patient's face is directed to the ceiling, the anæsthetist steadies the head with the palms of his hands and forms a resistance at the sides of the neck opposite the tonsils by the spread of the four fingers (not one) of each of his hands. Holding the guillotine in the left hand for the right tonsil, I introduce the guillotine into the mouth with the fenestra facing the feet. The fenestra is slipped over the lower pole of the tonsil, and the hand rotated upwards so that the whole tonsil is engaged in the fenestra. By steady lateral and partial rotary movements the tonsil is squirted through the fenestra and the pillars stripped off. The handle is then carried past the middle line, so that greater pressure is made over the posterior pillar. A slight forward pull of the guillotine, combined with the outward pressure, will ensure that the posterior pillar is stripped off the tonsil. The blade is then pushed home. Standing on the same side of the patient, that is, on the right side, but now facing the patient's head, I take the guillotine in my right hand and attack the left tonsil. My hand is rotated so that the fenestra again faces the feet. The lower pole is engaged, the hand rotated upwards, outward pressure made, the handle canted inwards, the blade raised, the tonsil "squirted" through, the blade pushed home, and the operation completed. The squirting through of the tonsil is largely assisted by the use of the forefinger of the other hand inside the mouth. I always push the blade home with the opposite hand, because if the thumb of the same hand is used the fenestrated end of the guillotine is almost certain to be tilted towards the centre of the throat, unless one has a blacksmith's

strength in his thumb and hand. By this means I feel certain that in the majority of cases at least nine-tenths of the tonsils are removed. Obstruction is relieved. It is no use cutting the tonsils flush with the pillars, for in that case the antro-posterior bulk is not reduced at all. Of course, there is tonsil tissue left, and as I have said before there is no reason why it should not be left, because it is there for a purpose. In some of these cases the tonsils can be practically enucleated.

THE OPERATION OF TONSILLECTOMY.

This I have reserved for chronic follicular tonsillitis, chronic lacunar tonsillitis, tuberculosis of the tonsil, and new growths. I have performed this operation in probably two or three hundred cases, and have used three methods.

The first method, which I taught myself, was done under local anæsthesia with the patient in the sitting position. I began with the right tnosil, which was grasped by its upper and lower poles with double-hooked forceps. These forceps are straight or slightly curved as a whole. Lateral curvature of the prongs I find bad. The tonsils are pulled towards the middle line by the assistant. I then take a pair of Mayo's scissors, which, though probe-pointed, cut right to the tip, and, outlining the palato-glossus muscle, I cut through the mucous membrane between that and the plica triangularis until I reach the glistening white layer covering the tonsil. This incision is carried up and down to the limits of the anterior pillar. I used to then insert my finger externally to the tonsil, breaking down the connection with the pharyngeal wall and finally stripping the tonsil off the posterior pillar. The tonsil was now adherent to the tonsillar sinus, near the lower pole. This was cut through with the Mayo's scissors. A swab well wrung out of pure peroxide was then held in the cavity to stop bleeding. Bleeding was usually very profuse at the time—and I have had my face smothered with blood coughed on to me by the patient—but it very rapidly ceased. The left tonsil was dealt with in a similar way, and I used my right hand as before. I have always worked without gloves, and have invariably followed the Edinburgh method of keeping my nails short and scrubbing my hands under a running tap with a brush and good soap for at least ten minutes. I do not use antiseptics at all. However, there is no objection to the use of thin rubber gloves, unless it be that one's sense of touch is slightly dulled thereby. In about half the cases done under local anæsthesia the pain was at a minimum or practically nil, but the mental effect on one's private patients was certainly not nil. In the other 50 per cent. of cases more or less pain was felt. This is probably partly because a certain percentage of people will not react to a local anæsthetic, but it may also be due to faulty administration or a bad drug. The worst cases were those where the pillars were firmly adherent to the tonsils and where the caspule and trabeculæ were hypertrophied as the result of past disease or operative interference. Here not only was the administration of the anæsthetic difficult, but the operation itself was difficult and prolonged.

My next method was enucleation under gas analgesia. I had one house surgeon who, though not specially gifted in other ways, was exceptionally good at administering gas analgesia. My procedure was the same, though bleeding was more copious, but it did not last long. Finding it impossible to get anyone to administer gas analgesia, I had finally to resort to general anæsthesia. Most of my anæsthetists prefer a mixture of chloroform and ether equal parts, given on a mask. One gave pure chloroform by a Junker inhaler. Here the patient was lying on his back and I sat on a stool opposite the tonsil I intended to take out. The head of the patient was inclined to me. At first I adopted the same procedure as before. Later, largely by accident, I came to find that the so-called capsule of the tonsil could be split up into one or more layers, and, using a Mayo's scissors from the same point of the mucous membrane, I cut down until I could just see the tonsillar tissue shine through a very thin capsule. Instead of using the finger, now I use the closed blades of the scissors and complete the separation of the tonsil from its bed except from the posterior pillar. Drawing now the tonsil towards the front of the mouth, I cut away the mucous membrane of the posterior pillar from the tonsil, hugging the tonsil with the scissors as close as possible. This ensured that the inner edge of the posterior pillar remained intact, leaving a certain amount of mucous membrane to cover the anterior surface of the posterior pillar. The tonsil was severed from its base by the scissors as before. In the cases where I struck the right layer I got my best results with a sinus tonsillaris covered with mucous membrane and no distortion of the pillars.

The next mehod I adopted was a modification of Sluder's. Using a general anæsthetic, I take a MacKenzie guillotine with medium-sized fenestra, through which I pass the clips (or volsellum-forceps) up to the joint. The tonsil is grasped with the forceps as before and pulled towards the middle line. With Mayo's scissors I cut the mucous membrane between the Plica Triangularis and the anterior pillar down to the inner layer of the capsule of the tonsil. I then close the scissors, and using them as a blunt dissector, carefully separate most of the tonsil from its bed. The guillotine, whose outside face is to the tonsil—and it is the opposite tonsil that is worked on—is pressed firmly over the tonsil and the handle tilted outwards. The blade, which is fairly blunt, is now firmly pushed home and the tonsil separated from the posterior pillar. Given a good anæsthetic and no great adhesions, such as one gets after operations or quinsy, the result is a good one. Occasionally portions of the tonsils are left on the pillars, particularly at the upper angle of the sinus. This does not matter, unless part of a crypt is left.

ARREST OF HÆMORRHAGE.

Out of my series of between two and three hundred cases I have had a fairly large number of cases with severe hæmorrhage at the time of the operation. For this I have never stitched the pillars as I consider the practice bad, firstly, that if one does not use plugs

over which to stitch the pillars one is apt to get adhesions, and consequently worse deformity of the throat. If plugs of gauze are used, and the stitches placed over them, one is apt to cause retention of secretion in a septic cavity, and as in a complete enucleation, the soft tissue planes are all open, acute septic absorption appears very likely to happen. I had one case of acute angina which gave me a lot of anxiety following enucleation. There is another objection, too, to putting stitches in, in the case of private patients, and that is their removal; unless one puts in cat-gut and allows them to become absorbed, and here you would have cat-gut in a septic cavity. No one can make the mouth a perfectly aseptic cavity, nor can one be sure that all food is sterile. My practice used to be in cases of immediate hæmorrhage, to hold a plug of gauze well wrung out of peroxide in the sinus tonsillaris and the bleeding soon stopped. If the patient was fractious I administered a quarter of a grain of morphia and repeated one-sixth of a grain in two hours and found that controlled the hæmorrhage in most cases. In about ten or twelve cases I, or one of the house surgeons, have had to sit down by the patient and hold swabs in the cavity. In one case I stayed up all night with a man who was exceedingly nervous. On looking back I believe that he would have been all right with a fairly stiff dose of morphia. Some authors say that they catch the artery that descends from the upper part of the sinus, which they say can be seen and tied at the junction of the upper and middle thirds of the sinus. I have never done this. One case of a boy about 14 years of age who had had rheumatic endorcarditis gave me a very great deal of anxiety. For the first four or five hours he bled fairly profusely, and his pulse, which was irregular before the operation, almost disappeared, and I thought I was going to have my first fatality, but by sticking to him, holding swabs on to his tonsil beds, and giving him intravenous and rectal salines, I got him round in about five days. I have had several cases of reactionary hæmorrhage, and these have been dealt with in the same way as primary hæmorrhages. I have had two cases of secondary hæmorrhage, fortunately very slight. I did nothing to these but keep the mouth clean. I have had one death, but that occurred during the operation, and was due to anæsthetic shock and not to hæmorrhage.

AFTER TREATMENT.

I believe this is very important, but one must face the fact that it is very difficult to carry out. The mouth should be kept scrupulously clean and for that purpose, we have used numbers of lotions. In my private practice I have used weak peroxide, a solution of potassium permanganate, Dobell's lotion, and boracic lotion, and occasionally, a coarse spray of 1/8000 corrosive sublimate. All these lotions are used at a temperature of about 105° F. Peroxide is very cleansing for the teeth and mouth, but it is apt to displace clots and bring on reactionary or secondary hæmorrhage. The coarse spray of corrosive sublimate gently used, seems to me to be the best of all the lotions, from its antiseptic, astringent, and coagulative effects. But what private patients will tolerate much after-treatment in these cases? Many of my best

cases I have left strictly alone, leaving the nurse to keep the anterior part of the mouth and the teeth clean. The patients are put to bed and are given about three pillows. I keep them in bed for five days and let them out of hospital in seven days. On the seventh day, the throat is thoroughly inspected, and any loose pieces removed. The patient should be seen daily for the next fortnight, as during this time the sloughs which form in most cases are separating. The careful application of weak solutions of Silver Nitrate may encourage growth of epithelium over the sinus. In hospital cases the throats do not get this careful treatment. I now see the patient daily or every second day, and brush the tonsillar sinuses with 2% silver nitrate, and find that this keeps the parts clean and encourages rapid growth of epithelium.

AFTER RESULTS.

The difficulties of the anæsthetic and not having specialists in anæsthesia, make it necessary to speed up the operation. This speeding up prevents the proper elimination of blood, and it interferes with vision. Those cases which I did in the sitting position were my best, but I can get no one here to give a general anæsthetic in the sitting position. The first-class results, of course, should leave the pillars intact with a narrow sinus covered with epithelium, but in some cases one does get some adhesions of the pillars, some distortion of the palate, and yet the results to the patient are excellent. Even with distortion and absence of parts of a pillar—though one is ashamed when one sees these results—the voice is not interfered with, and the palate loses the blue, chronic congestion that it had before, and the patient's health is infinitely better. There is no question of doubt that despite the liability to distortion of the palate, better results can be obtained by enucleation than by partial removal of the tonsils. I have seen fauces of people over 35 years of age whose tonsils have been removed by specialists in Britain, and those specialists have been men for whom I have a great respect, and though the pillars are perfect I have found large remains of tonsils containing septic material, and with the usual blue congestion of the pillars and palate. The symptoms of these patients are the same as before their original operations, a constant fullness of the throat, and hawking irritation with occasionally more or less severe attacks of tonsillitis. I have had a few cases of people coming back to me complaining that despite the removal, they have had attacks of sore throats. On questioning them they have admitted that the sore throats were mild in comparison with those they suffered from before. On examining the throat I found the fauces quite healthy, but I have found lateral hypertrophic pharyngitis, a larg lingual tonsil, or an iiritable state of the posterior pharyngeal wall. These, I have been able to demonstrate, have been due to causes in the mouth, to mouth breathing, smoking, or to troubles in the nose. In no cases have the tonsil beds shown any sign of re-action. With regard to singers, I, personally, hesitate to do enucleation, because of the conditions under which I have to work, unless the patients submit to operation under a local anæsthetic.

If one insists on doing operations under local anæsthetics, and causes pain in only 1 per cent. of cases, where his neighbour may do them under a general anæsthetic, one will find that his patients begin to leave him. Patients, to-day, demand that the operation be done without them seeing, or knowing anything about it.

In connection with hæmorrhage during the operation, I saw to-day a returned soldier, whose right tonsil I had enucleated three weeks ago after a quinsy, and whose left tonsil I was unable to do properly owing to the man taking the anæsthetic badly. While preparing to punch out the ragged remains of the left tonsil, I noticed a very large artery pulsating immediately behind and partly external to the posterior pillar. On the right side a similar artery was seen pulsating half an inch behind the posterior pillar. This vessel was probably the internal carotid somewhat out of place on the left side.

For hæmorrhage I have used Parke Davis's solution of Pituitrin. At first I used it half an hour before the operation, but I found that the best results were obtained when it was given ten or twenty minutes after the operation. In nervous patients I find that a quarter to a third grain of morphia injected immediately after the operation, by lessening the excitability of the patient and of the heart, is the best means of controlling hæmorrhage.

I have no experience of the use of Emetine in hæmorrhage. Pelletier injects half a grain of Emetine fifteen minutes before the operation, and says he gets excellent results. He states that the coagulation time is reduced by 1/3. I have put patients for some days on 15 grains of calcium chloride thrice daily and have injected 10ccs of horse serum the night before the operation. Accurate observations were not made by me or by the house surgeons regarding these things, but I was not particularly struck with advantages produced by any of them. Coagulen—an extract of blood platelets —has been used by Kocher, of Berne, and one of his disciples says: "In a number of instances I have had an almost instantaneous effect in the shortening of the bleeding time." Thrombo-plastine—an extract of liver and brain of cattle—has been used by Cronin, of New York. He says that in a large number of cases there was no bleeding at all, and no bad after effects. He has had uniformly good results.

Milne Dickie (Edinburgh University Reports, 1914) makes these statements:—"One must conclude that in competent hands guillotine tonsillectomy is no more dangerous than tonsillotomy. Indeed, there has been a very noticeable decrease in the amount of primary hæmorrhage in the Royal Infirmary since tonsillectomy was adopted. Enucleation by dissection is, however, more serious, as when bleeding occurs it is apt to be more severe and to require energetic measures for its arrest." I fail to understand the sense of these statements. In my remarks I have stated that a proper dissection of the tonsil should split what is known as the capsule, leaving the pharyngeal fascia. I cannot see how the guillotine can possibly do this as well as dissection. I am supposing that the dissection is made with a blunt instrument. I use the closed Mayo's scissors.

If the proper layer is struck the hæmorrhage should not be alarming. Dickie also says that septic complications were almost certainly due to trauma from faulty technique.

Regarding injuries to the palate, I have to confess that I have had a number of minor injuries to the palate. I am willing to admit that some of these may be due to faulty technique, especially when I first commenced, but many of them are due to the difficulty experienced with the anæsthetic. My best results have been got when I used a local anæsthetic, or when I was able to choose my own anæsthetist. Again, as is often the case, one has to enucleate tonsils after someone else has performed tonsillotomy, where there are adhesions between the tonsil and the pillars. In many cases where one does the operation after quinsies and ulcerations, one meets with very great difficulty in dissecting out the tonsil. One must also remember that the operation is a serious one by whomso ever it may be done, and it should only be done to get ride of septic foci.

Dr. P. McBride, in the "Journal of Laryngology,' August, 1916," utters a much-needed warning against the ill-considered radical treatment of the tonsils. I agree with him thus far, that the operation should be considered a serious one, and it should only be done where one cannot get satisfactory results by other means. I disagree with Dickie, and still think that tonsillotomy is quite sufficient for simple enlargements of the tonsil.

Regarding the performance of this serious operation in the out-patient department, I cannot understand it being done at all, owing to the risks of re-actionary hæmorrhage and sepsis. Besides, after treatment is required for the first week in tonsillectomy. Even if it adds to the cost of operative work, children should be kept in for some days after this operation.

Goodale says "Recurrent acute Catarrhal infections of the throat require complete removal of the tonsil though immunity against subsequent attacks is not necessarily assured." I have one case in my mind where the result of the operation was excellent. The patient had B.C. Urine, and was subject to frequent sore throats. The tonsils were very cryptous and full of filthy debris. She still complained of occasional sore throats. The pillars showed no reaction, but the posterior pharyngeal wall was thickened, and the lingual tonsil was enlarged. The lymphoid tissues of these areas were responsible for the sore throats, and were probably subjects of chronic inflammation. The woman was a mouth-breather, though she could breathe fairly well through her nose.

RESUME:

In conclusion I would like to insist that in children below the age of twelve, greater consideration should be given to the tonsils than is now given. Tonsils do serve a useful purpose in the body, and they should not be removed unless they are interfering with the economy of the body. The pale hypertrophied tonsil is not the result of inflammation, but of added work thrown upon it. This tonsil should only be removed when it is interfering with swallowing, breathing through the nose, or with aeration of the

eustachian tubes. Even then, ordinary tonsillectomy is, in most cases, quite sufficient. Where the crypts or lacunæ are enlarged and full of debris, or where the tonsil is the site of chronic inflammation which is not amenable to local and general treatment, total removal in children is advisable. Total removal in children is also advisable where tuberculosis is suspected as in cases of tubercular glands of the neck. After puberty, tonsils which are suspected to be sites of chronic inflammation, that is chronic follicular tonsillitis, should be removed only when the nose and mouth have been restored to health. All cases of chronic lacunar tonsillitis with retention of debris should be removed, but all cases where cheesy deposits are found in the crypts should not be removed unless there is accompanying dilatation of the lacunæ. In the case of pure retention, it may be found sufficient to dissect away a large plica triangularis which is preventing the extrusion of the contents of the crypts. In adults the tonsils should show signs of retrogression after the age of 21. Any enlargements with inflammatory re-actions should be indications for removal, but, only after the nose and mouth have been proved to be free from infection. In all cases the nose and mouth must be cared for first, and a certain time allowed to elapse to enable the tonsils to recover if possible.

THE TONSIL HAS DISTINCT FUNCTIONS.

Firstly, it is a lymphatic gland which acts upon the waste material brought to it from the nose and mouth (teeth, gums, etc.). Secondly, the tonsils, during growth, keep the shape of the sinus tonsillaris on each side and direct the action of the pillar muscles. The tonsils, also, offer a broad surface between the pillars to catch the bolus of food as it is passed back from the tongue. There, the alternate actions of the pillar muscles, combined with the actions of the superior constrictors, force the bolus into the pharynx. The glands which open into the crypts coat the bolus with a certain amount of mucus which renders its passage down the pharynx easy.

The question of removal of tonsils in systemic diseases is a vexed one. My position is that the tonsils should be totally removed if they show any chronic inflammation. That chronic inflammation must be looked for and can only be found in some cases by drawing forwards and outwards the anterior pillars and dragging the tonsil out of its bed.

In the operation of enucleation, the pharyngeal fascia should be separated from the real capsule of the tonsil, and this can be done if care is taken in all cases except where there is mutilation as the result of past quinsies, and in old-standing constitutional ulcerations of the tonsil in people of middle age. It appears to me that it is not necessary to tie vessels in case of hæmorrhage, except in a few instances. A stiff dose of morphia will stop most cases of hæmorrhage. In some cases it may be necessary to keep up pressure for a while. I am against the practice of turning patients out of hospital immediately after this major operation, and think that greater care should be used in the after-treatment for the first fortnight to prevent sloughing and adhesions.